ERIC Document Resume	See Instruction Sheet	DATE OF RESUME	DATE RECEIVED

A. PUBLICATION DATA

1. ERIC NUMBER	2. ORIGINATOR CONTROL NO(S).	3. IDENTIFICATION NO.
ED002427	N.A.	N.A.

DO NOT WRITE IN SPACE BELOW

4. AUTHOR(S):
Crossman, David M.

MICROFILM COPY AVAILABLE
YES ☒ NO ☐

5. TITLE OF DOCUMENT ABSTRACTED:
The Electronic Classroom: A Guide for Planning

COPYRIGHT GRANTED
YES ☐ NO ☒

COPYRIGHT RELEASE FILED
YES ☐ NO ☐

6. PUBLICATION TITLE:
N.A.

TYPE OF REPORT
PROPOSAL ☐
IN-PROGRESS ☐
FINAL ☒
FOLLOW-UP ☐

7. EDITOR(S):
N.A.

8. PLACE OF ORIGIN
ORG. The University of the State of N.Y., The
ST. State Education Dept.
CITY, STATE Albany, N.Y.

9. PUBLISHER OR SOURCE The University of the State of New York, The State Education Department, Albany, New York

OTHER ERIC REFERENCES:

10. VOL.	11. PAGES	12. MO./YR.	13. TOTAL PP.
N.A.	N.A.	9/64	60

TELE. EXT.
INST/LOC CODE

ERIC SATELLITE CODE

B. INDEXING DATA

14. SUBJECT AREA

15. TYPE OF ENDEAVOR
Report

16. INDEXING TERMS (6-12)

audiovisual aids	electronic classroom use	electronic classroom equipment	
electronic classroom	electronic classroom history		
teaching aids	electronic classroom purchase		

17. ABSTRACT (MAX. 250 WORDS)

Guides to aid administrators in the selection and installation of electronic classrooms are presented.

Advantages of an electronic classroom are that a variety of materials can be used; speech patterns can be recorded for subsequent evaluation; recorded lessons can be used again and again; progress of individual students can be monitored without disturbing other students; optimum conditions for hearing are provided for the student; and teachers can supply classes with live or recorded materials on an individual basis, allowing each student to respond independently.

While the greatest usefulness of the electronic classroom is in the teaching of a modern foreign language, it is also suitable for teaching an elementary course in Chaucer, for learning music appreciation and oral interpretation, and for drill purposes in the teaching of shorthand and other business skills. Most electronic classroom installations are either of the listen-respond type, the listen-respond audio-active type, or the listen-respond-record type. A great variety of recorded material is available; much is coordinated with textbooks.

The purchasing of an electronic classroom involves initial meetings of faculty and administrative officers, consultant assistance, accumulation of vendor information, visits to schools with electronic classroom facilities, writing specifications, advertisements for bids, bid openings, awards of contract, installation, inspection by a qualified technician, faculty training, and payment to the vendor. Recommended specifications for equipment for both teachers and students and appendices are included.

ERIC No.

18. SOURCE OF ABSTRACT

C. FUNDING DATA

19. SUPPORTING ORGANIZATION	20. DIVISION OR DEPT.	21. CONTRACT NO. / PROJECT NO.
	22. TOTAL COST OF PROJECT	
	23. DURATION OF PROJECT	U.S. Department of Health, Education, and Welfare Office of Education

ED002427

NYSED

Norman D. Kurland, Director
Center on Innovation
New York State Education Department
Albany, New York 12224

The electronic classroom: a guide for planning

JO708

THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT
DIVISION OF EDUCATIONAL COMMUNICATIONS

The Electronic Classroom: A Guide for Planning

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education

This document has been reproduced exactly as received from the person or organization originating it. Points of view or opinions stated do not necessarily represent official Office of Education position or policy.

Prepared by

David M. Crossman
Associate in Educational Communications

The University of the State of New York
The State Education Department
Albany, New York 12224

September 1964

JO708 ED002427

ACKNOWLEDGEMENTS

Grateful acknowledgement is given to Jerald R. Green, Associate in Foreign Languages Education, and to Walter E. Schoenborn, Title III Administrator, N.D.E.A., for their careful readings of the text and the many helpful suggestions they provided.

The cover was designed by George Wiesner.

ED032427

TABLE OF CONTENTS

Chapter

I. A BRIEF HISTORY ..... Page 1

II. A STATEMENT OF RATIONALE ..... Page 5

Modes of Use ..... Page 7
1. Class Use ..... Page 7
2. Library Use ..... Page 7

III. USING THE ELECTRONIC CLASSROOM ..... Page 9

Listen-Respond ..... Page 10
Listen-Respond (Audio-Active) ..... Page 10
Listen-Respond-Record ..... Page 11
Electronic Classroom Materials ..... Page 12
Electronic Classroom Scheduling and Coordination ..... Page 13

IV. PURCHASING AN ELECTRONIC CLASSROOM ..... Page 19

Initial Meeting of Faculty and Administrative Officers ..... Page 20
Consultant Assistance ..... Page 20
Accumulation of Vendor Information ..... Page 21
Visit to Schools with EC Facilities ..... Page 21
Writing of Specifications ..... Page 22
Title III Request for Approval ..... Page 23
Advertisement for Bids ..... Page 23
Bid Opening ..... Page 23
Award of Contract ..... Page 23
Installation ..... Page 24
Inspection by a Qualified Technician ..... Page 24
Faculty Training Period ..... Page 25
EC Placed in Service ..... Page 25
Payment to Vendor ..... Page 26

V. ELECTRONIC CLASSROOM EQUIPMENT ..... Page 27

Teacher's Equipment ..... Page 27
Student Equipment ..... Page 30

Appendices

A. SPECIFICATIONS FOR AN ELECTRONIC CLASSROOM ..... Page 35

B. REFERENCE MATERIAL ..... Page 50

C. DIRECTORY OF MANUFACTURERS OF ELECTRONIC CLASSROOM EQUIPMENT ..... Page 54

Chapter I

A Brief History

The electronic classroom has progressed, in six short years, from a rather primitive innovation to a widely accepted new teaching tool. Used now in a great variety of ways, it has solved some very basic teaching problems.

In the context of this guidebook, the electronic classroom will be defined as an integrated group of electronic components installed in a learning space and designed to provide for and improve individual communication in that space.

This type of installation has come to take a variety of forms, and, as with many innovations, has been the subject of much controversy and many varying points of view.

The most important single benefactor of the electronic classroom has, of course, been the field of modern foreign languages. The electronic classroom is particularly well suited for the teaching of foreign languages and has been found to be appropriate for a variety of other fields as well. Some of these other areas are discussed in Chapter III.

Because the electronic classroom can facilitate the task of the foreign language teacher and because the learning of foreign languages is in the national interest, electronic equipment capable of serving foreign language teaching needs has, quite understandably, formed the historical antecedents for the modern electronic classroom.

As early as 1882, the Cortina Academy was making language records of the Edison cylinder type. In 1928 Middlebury College had established a phonetics laboratory. Although laboratories of this kind were fairly common in the twenties, they were largely confined to the teaching of phonetics and did not include drill in pronunciation.[1] The earliest types of language equipment (which was not special language equipment at all, but just the very ordinary cylinder grammophone) were unsatisfactory and frustrating to use. Records were rather expensive, could not be erased, and played only about 3 minutes.

The cylinder was followed with the long standard 78 rpm shellac recordings.

Thousands of language records made on this base are still in daily use 19 years after the development of the long playing record. However, the same problem prevailed. While the 78 rpm record was fine for pre-recorded material, it was a costly and time consuming process to cut one's own recordings. So clumsy was this method that recording by students was almost out of the question.

At the end of World War II an experiment was made at Western Reserve University with a magnetic steel loop called the Soundmirror, which was developed by the Brush Development Corporation of Cleveland, Ohio. It was first used not by language departments at all, but by departments of speech and drama. A recording made on the Soundmirror lasted 15 seconds at the most, and played continuously on an endless belt.[2] Robert S. Whitehouse in 1945 predicted the future of the electronic classroom in

---

1. Marty, Fernand, "Language Lab Techniques: How to Get the Most out of Tape Equipment," Educational Screen, 37:176-7, Apr. 1958.
2. King, Paul E., Study on Modern Language Laboratories, (unpublished mimeographed paper), pp. 9-10, 1955.

speaking about his Workshop Program at Birmingham Southern College. "With this nucleus of a fully staffed language laboratory a reality, future progress is sure to be noted in no uncertain degree. It is but a step from hearing records in foreign languages to making student recordings in the laboratory."[3]

Since those first perceptive remarks by Robert Whitehouse in 1945, the electronic classroom has grown and flourished. Since that time, we have seen a variety of electronic devices incorporated into the electronic classroom.

The first important device of this type was the magnetic wire recorder introduced in 1946. Crude and difficult to use, this machine was made obsolete later in the year with the development of the tape recorder. It soon became abundantly clear that the use of magnetic tape was far superior to the use of wire, and shortly production of the wire machine was stopped.

With the development of the ¼" magnetic tape, the use of recording in the learning of a foreign language changed from a tool used chiefly to supplement written expression to one that could be used to develop better oral expression and also serve as a basis for the evaluation of progress.

Subsequent to the introduction of magnetic tape, the magnetic disc was developed, and for several years enjoyed wide popularity. This innovation consisted of a flexible 9" disc coated with magnetic material similar to that used on tapes. Like magnetic tape it could be readily

---

3. Whitehouse, Robert S., "The Workshop Program: Demonstrating The Value Of The Language Laboratory," Modern Language Journal, 29: 590-5 Nov. 1945

erased and was particularly safe in students' hands. Unfortunately, the audio quality of this device was far from adequate to cope with the subtleties of spoken language and is no longer in wide use.

From 1958 to the present an enormous variety of electronic classroom equipment has come onto the market. In 1958 only two firms were engaged in the production of complete facilities. As of 1964, there were no fewer than 27 firms engaged in the design and manufacture of electronic classroom equipment. From this enormous range of equipment can be chosen an almost infinite variety of systems to suit the needs of individual schools.

The intelligent selection and installation of an electronic classroom is a tedious, time consuming, and costly matter for any schoolman. It is hoped that this guide will prove useful in this important task.

Chapter II

Statement of Rationale

Inevitably, the first question to be raised by a board of education considering an electronic classroom is: "What good is it?" This question is normally followed closely with, "What does it cost?" "Who else is using one?" "Is it effective?" "What is the teacher's role?" And so on.

An item by item rationale will serve as a point of departure.

1. The electronic classroom has a multiplicative function. It enables a teacher to supply a class with either live or recorded material on an individual basis. Each student is able to respond to this material independent of any other student. The use of a headphone and microphone for each student makes it possible for him to respond to each item of a program. A conventional classroom permits only one communication at a time; that between one individual and one other individual or group. The simple arithmetic of simultaneous individual responses versus the single individual response makes abundantly clear one of the main reasons for the use of the electronic classroom.

2. A single recorded example of any lesson can be used again and again with identical output each time. Teacher fatigue ceases to be a factor as recorded repetitions are required. A teacher in a drill situation frequently grows impatient and may vary his pronunciation and intonation, causing student confusion and frustration. The electronic classroom, on the other hand, is able to supply a constant unchanging

model as long as it is needed.

3. The electronic classroom provides each student with optimum conditions for hearing. Through individual volume controls, each student is able to hear the program at a comfortable level, and, with the use of padded earphones, is able to block out virtually all extraneous sound.

4. The electronic classroom permits the use of great variety of program material. In the so-called "conventional" classroom, students normally have contact with only one instructor. They become conditioned to his methods, his tone of voice, and his disposition. With the electronic classroom, a great variety of instructors can be provided through the use of prerecorded programs. These can take the forms of commercially available tapes or locally produced recordings.

5. Until comparatively recently, the traditional method of evaluating students for listening comprehension was done through pencil and paper techniques. With the use of electronic classroom equipment, it becomes possible for students to record requested speech patterns for subsequent evaluation.

6. In some electronic classrooms, program material can be placed under student control. In this manner students may proceed at varying rates of speed according to their individual learning rates. This, of course, encourages more advanced students to forge ahead without frustrating slower students.

7. In virtually every mode of use within the electronic classroom, the teacher can monitor the progress of individual students without disturbing other students.

Modes of Use

During the last six years the electronic classroom has been subjected to a great many patterns of usage. These diverse patterns all fall within the two major categories: (1) Class or group use and (2) library or individual use.

1. Class Use - Because of its very design the electronic classroom provides for an individual learning concept. However, because of the high cost of electronic classroom equipment, lack of space, and the complexity of scheduling problems in most schools, it is usually necessary for all students to be brought to the same location for electronic classroom work.

In virtually all courses, the electronic classroom forms only a part of a larger area of study. In foreign languages the electronic classroom has proved valuable for the development of structure patterns, critical listening, speech production, and pronunication; less so for reading and writing competencies. It has become increasingly apparent that through the electronic classroom, students can be provided with extensive amounts of programmed material without complete understanding. It is quite common for students to be lulled into a semiconscious state of hearing but not listening. Because of the great importance of the development of correct habit formations within the electronic classroom, it is highly recommended that teacher monitoring play a large role in all courses in which structure is presented.

2. Library Use - It has been pointed out that a fundamental justification of the electronic classroom is based upon the individualization of learning. This is essentially a private, tutorial environment

made possible through electronic equipment. The idea of "library" use of the electronic classroom is based upon the availability of equipment and materials for use by students on an individual basis. While the "library" concept does encourage student use of the electronic classroom outside of the group situation, it does not remove the desirability of the presence of a teacher to monitor student responses, particularly where language structure is involved. In an electronic classroom so scheduled, students can come and check out recorded material, and use it on equipment available for that purpose much as a library book is withdrawn. Hence, the name "library" use. For some schools, this mode of use is provided in addition to regularly scheduled EC periods. In many installations, several student positions in the EC are specially wired and equipped for library use. However, because of the great demand for individual access to the equipment, some schools have found it necessary to provide a separate installation for individual study carrels.

Chapter III

Using the Electronic Classroom

It is generally understood, and correctly so, that the electronic classroom has, so far, demonstrated its greatest usefulness in the teaching of modern foreign languages. The name "electronic classroom" has been adopted for use in this handbook to permit the consideration of this type of equipment for wider use in a variety of problem teaching areas. This type of facility can easily be adopted to any teaching situation where audio skills are necessary and where practice and drill is part of the learning task.

For example, the English Department at Elmira College found the electronic classroom there particularly suitable for the teaching of an elementary course in Chaucer. Using prerecorded materials, the unfamiliar prose of Middle English took on new meaning as students heard it correctly spoken.

At Syracuse University, the speech and music departments have both found the electronic classroom helpful in the learning of music appreciation and oral interpretation.

At the Arcadia High School, in Greece, New York, electronic classroom facilities are now being used for drill purposes in the teaching of shorthand and other business skills.

Electronic classrooms are normally designed to meet the needs of the particular school into which it is to be installed. However, most

installations can be conveniently divided into three main types: (1) Listen-respond; (2) listen-respond (audio-active); and (3) listen-respond-record.

Listen-Respond

The simplest type of EC, this kind of installation permits students to listen, through headphones, and to respond to any type of audio material distributed to them. Depending upon the number of channels available, a variety of different programs can be distributed simultaneously. This facility is, of course, particularly valuable where the EC is being used for "library" purposes. While not sufficiently flexible for usefulness at the secondary level, mobile equipment of this type can be appropriately utilized in the elementary school.

Listen-Respond (Audio-Active)

A refinement of the simple listening type EC has come to be known as the listen-respond or audio-active concept. By installing a microphone and amplifier at each student position and connecting it to the headphones, a student is able to hear not only programs from an outside source, but his own voice as well. This arrangement has the advantage of placing the response of the individual student in the same acoustical perspective as the program material being sent to him. Psychologically and physiologically it permits the student to hear himself much as others hear him.

Early use of this environment for the teaching of language centered around mimicry and memorization of prerecorded dialogue material. More

recently, however, the listen-respond mode has been found to be particularly well suited for the teaching of language structure in the form of pattern drills. The pattern drill focuses attention on one fixed construct a single element of which is constantly varied. In this manner, automatic use of structural patterns is developed and new vocabulary learned through appropriate manipulation of the pattern.

Listen-Respond-Record

The addition of a tape recorder in this third method of use permits a rather different philosophy to be incorporated into the EC. A student records both the original program material and his responses to it. Subsequent replaying permits direct comparison between the response and the original program material. Using the "library" system with this type of equipment makes it possible for an individual student to make as many recordings as necessary to approximate the model program.

A long and sometimes fierce debate persists over the relative merits of these last two modes of EC usage. The supporters of the listen-respond mode feel that this is the wisest use of time in the EC. They feel that mistakes made by students should not be reinforced by recordings. The listen-respond supporter maintains that the errors of students, and particularly beginning students, should be consigned to oblivion.

Those supporting the "listen-respond-record" point of view maintain that only through this mode of use is a student able to properly juxtapose his own response with that of a model. They suggest further that independent use of this equipment permits multiple recorded responses, each one more successfully approximating the model.

In a recent study of this mode of usage, Sarah W. Lorge of the New York City Board of Education reports that "The recording-playback group achieved significantly greater gains in overall quality of speech and in listening comprehension in comparison with the audio-active group."[4] The answer to this debate, if indeed there is an answer, has yet to be found. While it is true that some research favors the audio-active-record mode, the evidence is by no means overwhelming or consistent.

An additional factor is that of expense. To supply a tape recorder for every student position in the electronic classroom more than doubles the cost of such an installation.

At the present writing, the Title III Office of the National Defense Education Act in New York State will approve no more than 6 audio-active-record positions in a total 30 position audio-active electronic classroom.[5]

Within the general framework of the three patterns of EC use described above are numerous variations made possible by the kind and sophistication of equipment used. Some of these variations will be described in Chapter V.

Electronic Classroom Materials

Of immediate concern, however, are the materials available for the electronic classroom and how they are integrated into course structure.

As recently as 1958, virtually all recordings used in the electronic

4. Lorge, Sarah W., The Relative Effectiveness of Four Types of Language Laboratory Experiences, Bureau of Audio-visual Instruction, Board of Education of the City of New York, an Experiment Conducted with the Cooperation and Financial Assistance of the New York State Education Department, Albany, Project A 61/62, p. 24.
5. Title III NDEA Planning Guide, New York State Education Department, Albany, 1964-65.

classroom were prepared by the faculty that used them. The burden upon foreign language departments was enormous. A typical college pattern of that year went something like this: Of five class meetings per week, two were designated as EC sessions. On the average two to three hours of tape preparation went into the recording of each EC session in addition to the normal preparation of three conventional class meetings. It was not uncommon for a teacher to maintain a load of this kind for two and sometimes three different languages. For many, this became a debilitating experience. Equipment failure added to this kind of load made the electronic classroom an impossible experience for many capable and enthusiastic language teachers.

The FL textbook publisher was quick to recognize this dilemma. Today, though certainly not of equally high quality, a great variety of pre-recorded material is available much of which is coordinated with textbooks.[6]

Electronic Classroom Scheduling and Coordination

As the EC has become a more common and accepted teaching tool, the task of integrating the activities of the electronic classroom with other parts of a course of study has occupied a great deal of attention. A number of factors influence this kind of coordination. One of the most important of these is the schedule pattern for use of the EC. Until very recently, it was accepted practice that the EC should be used only when the electronic equipment was required. Students are frequently assigned laboratory periods in the EC and then, at different and usually not

6. The New York State Education Department publishes a bibliography including many of these materials, entitled Let's Learn About Language Labs.

contiguous periods of time, are assigned "recitation" periods. This system has the effect of detaching EC work from the mainstream of the course.

A far more effective approach to the physical problem of coordination is the so-called "convertible classroom." By installing electronic classroom furniture which does not incorporate elaborate booth partitioning for each student, the classroom can be used easily for both electronic and nonelectronic purposes. It is frequently desirable to introduce new material and then turn directly to a drill or listening exercise. With the "convertible" type classroom, this is easily done. A common installation of this kind incorporates a fold-down desk which completely covers equipment when it is not being used.

The degree of integration of electronic classroom time within the body of a course seems to be determined by 3 factors: (1) The knowledgeability and attitude of the teacher; (2) the interrelatedness of class materials and EC materials; (3) the number of students using the EC.

To have suggested perhaps 10 years ago that the foreign language teacher would be the central figure in this new wave of educational technology would have been thought to be a capricious departure from reality. The teacher of foreign language has been traditionally rooted deeply in the humanistic tradition. His orientation is to linguistic communication, and not, one would think, to electronic technology. And yet, the electronic classroom has gradually become acceptable to him. As a result, the role of the EC has become a tool which occupies an important role in the teaching of modern foreign languages.

This acceptance of the EC has not been without difficulty. In a

recent publication of the National Education Association, Department of Audiovisual Instruction, Elton Hocking has expressed a number of important problems relating to the language laboratory and electronic classroom.[7] Rated only below the lack of teacher training and lack of teacher time, he reports that teacher attitude constitutes a major deterrent to good electronic classroom usage. He refers to a rejection of new methods and materials as a result of habit or inertia. He suggests also that a negative attitude can and does develop as a result of faulty equipment. Most of the equipment used in the first electronic classrooms was designed to be used in the home. This equipment was never meant for continuous use in school applications. As a result, breakdowns were a constant problem and student and teacher morale suffered in direct proportion. Service difficulties of this kind became so numerous that many schools simply stopped using the equipment altogether. Fortunately, most electronic classroom equipment is now being manufactured to withstand the rigors of school use.

So far, we have discussed the electronic classroom primarily from the standpoint of its usefulness for drill situations. A rather slow but very definite trend is in progress throughout the nation which is enlarging the concept of the electronic classroom from that of a learning work area used for the exercise of skills to a facility that will have available all of the newer media for a wide variety of learning experiences.

---

7. Hocking, Elton, Language Laboratory and Language Learning, Mono. No. 2, Department of Audio-Visual Instruction, National Educational Association, Washington, 1964.

A singular illustration of this multimedia approach designed for EC usage has been developed by George Borglum of Wayne State University.[8]

Fully a decade before the enactment of the National Defense Education Act, Dr. Borglum became involved in the production of documentary motion pictures for the French in their own language in an attempt to boost morale in that country during World War II. Because of the success of this venture, he became interested in the value of the direct culturally oriented method of teaching foreign languages to beginners.

In 1959 the U.S. Office of Education awarded a grant to Dr. Borglum under the provisions of N.D.E.A. to pursue this idea. Since that time a comprehensive package of materials has been prepared under his supervision and subjected to extensive experimentation. The bulk of the research has demonstrated a positive increase in student motivation and has shown that the cultural orientation which the use of these media provides, encourages greater quantity and higher quality of verbal communication when contrasted with conventional technology. Borglum suggests that this leads to a positive increase in the development of speech skills.

Professor Louis Forsdale, of Teachers College, Columbia University, has developed an interesting concept utilizing the 8mm motion picture cartridge. In an experimental production designed to assist foreign students in the learning of English, Dr. Forsdale simulates on film an encounter between two English speaking students and one foreign student. The short dialogue is completed with a set of directions spoken to the foreign student by the Americans. The second cartridge repeats the first

8. Borglum, George P., Modern Language Audio-Visual Research Project, United States Office of Health, Education and Welfare, 1964.

encounter exactly except that the foreign student is removed and the American couple speak directly to the viewer of the film. This ingenious technique completely involves the viewer and encourages him to respond to questions from the screen.

These are but two examples of rather recently developed and carefully coordinated visual materials for use in the electronic classroom.

On a more comprehensive plane is the now famous "Parlons Français" TV and film program for teaching French in the elementary school. This TV and film program has been prepared by the Modern Language Project of the Council for Public Schools in Boston. Utilizing the imaginative puppets of Bill and Cora Baird, the object of this system of materials is to provide an integrated program of at least three years of French in which the teaching task is shared by the classroom teacher and the TV teacher, Mrs. Anne Slack. In its research subsequent to the production of "Parlons Français," the Project has determined that the TV lessons used alone are not effective. For satisfactory achievement, at least 30 minutes of weekly follow-up time should be spent in class by the classroom teacher in addition to the 2 weekly telecasts or films at the first two levels of the program. The Project recommends 45 minutes of weekly follow-up time at the third level.

Multimedia course packages such as "Parlons Français" and now its Spanish counterpart "Una Aventura Española," provide a wealth of nonverbal material all of which has motivational and cultural value. The visual dimension in the electronic classroom is still in its early stages of development. Most well-equipped electronic classrooms are still only aurally oriented. Infrequently has provision been made for an 8 or 16mm projector. Only rarely is room darkening provided in the EC for

projection purposes. EC's oriented with desks toward the console usually do not have good sight lines to a projection screen of adequate size.

Electronic classrooms being planned today require care in the design of their visual facilities as well as their audio equipment.

Chapter IV

Purchasing an Electronic Classroom

For most school administrators and their faculties, the selection and purchase of an electronic classroom is a difficult and time consuming experience. Few schools have personnel trained to evaluate the complexities of electronic classroom equipment. The following chapter is intended to provide the electronic classroom purchaser with specific help in nontechnical language.

The following suggested procedural guidelines presume that a decision to purchase an electronic classroom has been reached:

1. Initial meeting of faculty and administrative officials.
2. Consultant assistance.
3. Accumulation of vendor information.
4. Visits to schools with EC facilities.
5. Writing of specifications.
6. Title III Office request for approval.
7. Advertisement for bids.
8. Bid opening
9. Award of contract.
10. Installation.
11. Inspection by a qualified technician.
12. Faculty training period.

13. EC placed into service.

14. Payment to vendor.

1. Initial Meeting of Faculty and Administrative Officers

In the early planning stage, perhaps the most important single factor in the initial success of an EC installation is the attitude of the faculty that will use it. Without their full cooperation and involvement in planning, a facility of this complexity is quite likely to be poorly used, or perhaps not used at all, once installed. The electronic classroom is no longer rare, and many faculty members, while having no EC in their own school, may have had experience with one at an NDEA Institute, during an in-service course, or in a previous position. Beginning teachers frequently have had extensive exposure to EC techniques during their undergraduate years and may be able to make excellent contributions to the planning. It is important at this first meeting to identify the programs for which the EC will be applicable, the number of students that must be accommodated, and the way the EC can be integrated into the schedule of the school day. From the standpoint of efficiency, the appointment of a faculty committee and a chairman provides some organization for the task. This initial meeting will, of course, be followed by others, formal and informal, as each of the succeeding steps is taken.

2. Consultant Assistance

Recognizing that wide experience in EC design and usage is normally not available in a school acquiring such a facility for the first time,

expert help is very much to be recommended.

A consultant engaged at this stage can help you analyze your needs, advise you on particular systems of equipment, and usually recommend model installations in schools of similar size and organization that can be made available for your inspection.

Consultant help is available for EC planning through the Division of Educational Communications and through the Bureau of Foreign Languages Education of the New York State Education Department.

3. Accumulation of Vendor Information

After basic decisions of purpose, size, and location have been determined, it then becomes necessary to determine what equipment is available and a general estimate of cost. A list of vendors manufacturing EC equipment is listed in Appendix C.

4. Visits to Schools with EC Facilities

Henry Brickell, in his analysis of innovation in New York State,[9] has stressed the importance of the on-location visit to a school where a new facility is actually being used under normal conditions. No amount of literature can be as helpful as an actual visit to a school of your size with problems similar to yours. Several such visits can provide you with information that can save you from making important mistakes later on.

9. Brickell, Henry M., Organizing New York State for Educational Change. New York State Education Department, Albany, p. 67, 1961

5. Writing of Specifications

During the summer of 1963, representatives of the Division of Educational Communications, The Bureau of Foreign Languages Education, and the Title III N.D.E.A. Office of the New York State Education Department met to consider the feasibility of a newly developed set of specifications for electronic classrooms in New York State schools.

A decision was reached to recommend school use of the excellent specifications of Alfred S. Hayes published by the U.S. Department of Health, Education and Welfare, Bulletin 1963, No. 37, entitled, Language Laboratory Facilities, Technical Guide for the Selection, Purchase, Use & Maintenance. This document, published jointly by the United States Office of Education and the Electronic Industries Association, represents a partial answer to a long felt need. These specifications, which can be found reprinted in Appendix A, are based solely upon educational requirements and are predicated upon his statement that "Adequate sound reproduction for foreign language instruction requires a quality standard second only to that of high fidelity professional recording and reproducing equipment, much higher than that needed in applications whose primary requirement is the intelligible reproduction of native-language speech."[10]

The specifications written by Alfred Hayes represent a new high in quality insurance on the part of the purchaser. Until these specifications became available, a school was left with no alternative than securing its specifications from a collection of recommendations or from industry.

10. Hayes, Alfred S., Language Laboratory Facilities, Technical Guide for the Selection, Purchase, Use and Maintenance, United States Department of Health, Education and Welfare, Bulletin 1963, No. 37.

The Hayes specifications, while providing for several functional alternatives, insure very high minimum quality standards and permit a school to operate completely within competitive bidding practices.

6. Title III Office Request for Approval

If the electronic classroom is to be funded with the assistance of Title III, National Defense Education Act, approval is required in writing from the State Education Department Title III Office prior to the placement of an order.

7. Advertisement for Bids

Under the provisions of Section 103 of the General Municipal Law of New York State, purchase contracts involving an expenditure of more than one thousand dollars must be secured through competitive bidding. The advertisement for such bids must be published in the newspaper, with at least five days lapsing before the opening and reading of such bids.

8. Bid Opening (Section 103 General Municipal Law)

The published advertisement for bids must contain a statement of the time and place where such bids are to be opened. All bids must be publicly opened.

9. Award of Contract (Section 103 Municipal Law)

The contract shall be awarded to the lowest responsible bidder furnishing the required security.

10. Installation

Care is necessary here to provide for ample time for an unhurried and carefully supervised installation. In general, contracts awarded in late spring are most convenient since the installation can be made during the summer months. Alternatively, an installation can be scheduled during a holiday period.

11. Inspection by a Qualified Technician

It is difficult to overemphasize this important step. It is only through the careful testing of a new EC by a qualified technician that one can be assured that the performance specifications discussed in item five above have been met. A new installation failing to meet performance specifications should, of course, not be accepted or paid for until specifications have been satisfied.

Contact with such a technician is, however, sometimes difficult and the inspection itself is almost always time-consuming. Nearby universities with large electronic classrooms frequently have staff members or have access to individuals who meet the requisite technical qualifications. This "qualified" technician defies categorical description but should have at least the following competencies: (1) He should have wide experience in the use of electronic test equipment and in the interpretation and measurement of electronic specifications; (2) he should have a highly critical ear; (3) he must be completely disinterested in the installation which he inspects.

12. Faculty Training Period

Earlier reference was made to the importance of teacher attitude towards EC usage. The way in which the faculty training sessions are conducted will have an extremely important effect upon faculty attitude and their competence in using new electronic classroom equipment.

Perhaps the key, if there is one, to successful use of an electronic classroom is confidence on the part of the teacher using it. This kind of confidence is certainly not gained by the simple one-time mimicking of a salesman's manipulation of the equipment. It is built upon solitary, repetitious overlearning of the necessary skills until they become virtually automatic. Whether the training sessions are conducted by school personnel or other personnel is not particularly important. What is important is that a sufficient number of sessions be scheduled to enable every member of the faculty who will use the EC to have individual instruction until a high level of confidence can be established. A preschool workshop for this kind of orientation is ideal if the equipment is installed during the summer.

It should be understood that these training sessions represent only a first step in achieving teacher competence with equipment of this kind. The level of facility to be desired can only be gained through use with students in the classroom.

13. EC Placed in Service

It is hoped that the foregoing steps will have provided for a smooth introduction of a new electronic classroom to the students who will use it. By incorporating well written specifications, and through a

careful program of faculty involvement from initial planning to initial training in its use, a new EC can be placed into service with a minimum of difficulty.

14. Payment to Vendor

It is recommended that contract awards with the vendor include a clause reserving the right to withhold final payment for equipment furnished and services rendered by the vendor until 30 calendar days shall have elapsed during which operation shall have included full and satisfactory implementation of all specified functions of all equipment and performance at least according to the minimum standards set forth in the specifications as certified by the technician referred to in item 11 above. The last day of this 30 day period shall be considered the official completion date. Payment should be made promptly at the end of this period provided all specifications have been met.

Chapter V

Electronic Classroom Equipment

Teacher's Equipment

1. Teacher's Console

The teacher's console is the main control point of the electronic classroom; the center from which all audio distribution is originated.

A. Program Sources - The number of sources to be originated from the console is determined by the complexity of the EC and the variety of ways it is to be used. Ordinarily the following sources are sufficient:

(1) A microphone source - for direct line communication between teacher and student. This source and all others should be capable of being switched from all students simultaneously to any single student or any group of students.

(2) Two tape playback sources - these sources permit the playing of any tape-recorded material. If these sources are equipped, in addition, with recording electronics, it is possible to utilize them for the recording of student responses for subsequent evaluation.

(3) Record player source - this source permits the playing of any disc-recorded material.

(4) One motion picture audio source - this source

permits distribution to headphones of motion picture sound in the EC.

(5) One spare source - this spare, wired to a connecting jack on the teacher's console, permits the use of any additional sound equipment not ordinarily kept in the EC. This might consist of a shortwave radio, a TV set, or an extra tape recorder.

B. Intercommunication Unit - The incorporation of this type of unit into the EC console permits a teacher to monitor any single student without his knowledge and to initiate a two-way conversation with him when necessary. This feature makes it possible to communicate with any single student or group of students without disturbing the other students of a class.

C. Additional Teacher Control Functions - In the construction of new EC facilities, considerable help can be provided for the using teacher by the centralizing of control functions on the main console.

(1) With the installation of "convertible" type student positions, excellent control can be provided over access to equipment by the incorporation of an electrically controlled student position locking system. The press of a button on the console unlocks equipment for student use only when needed. By closing the covers of student positions, equipment then becomes unavailable to the student until needed once again.

(2) The increasing use of visual equipment in the electronic classroom is greatly facilitated by the provision of lighting control from the console. New installations can usually be easily wired, so that all artificial lighting can be controlled from the console as well as from conventional door locations. Dimmable or preset levels of artificial lighting incorporated into electronic classroom design permit precise control of light for projection purposes.[11]

(3) A second modification can serve to facilitate and encourage the use of projected visuals. The frustrations of operating slide projectors from the rear of a classroom and trying to teach at the same time are well known to most teachers. The availability of reliable and inexpensive remote-controlled 2"x2" slide projectors makes it most desirable to specify a circuit from the rear of the classroom into the teacher's console which will permit control of such projectors from the console.

---

11. For an excellent analysis of classroom lighting, see Koppes, Wayne F., Green, Allen C., and Gassman, M.C., Design Criteria for Learning Spaces, Rennselaer Polytechnic Institute, Troy, N.Y. for the Office of Facilities, State University of New York, Albany, N.Y., 1963.

2. Visual Equipment and Facilities For Its Use

Some mention has been made above of the control of visual equipment. While not detailed in the specifications suggested in the Appendix, it is felt that every electronic classroom should have access to the following types of visual equipment and facilities:

(a) 16mm motion picture projector;

(b) 2"x2" slide projector (capable of remote control: forward, reverse, and focus);

(c) 10"x10" overhead projector;

(d) Permanently-mounted projection screen specially selected to meet the room configurations in which it is to be used;[12]

(e) Adequate natural light control facilities. Whether venetian blinds, drapes, or other types of natural light control, equipment should be capable of reducing screen brightness to a level of not more than .15 foot candles.[13]

Student Equipment

1. Headphones and Microphones

Of all the components in the electronic classroom, none is quite as difficult to specify as the headphone. Techniques for testing headphone performance involve a simulation of the human ear, together with a condenser microphone of laboratory quality. Equipment of this kind is

12. For an excellent discussion of suitable screen types and sizes, consult Foundation for Effective Audiovisual Projection, Eastman Kodak Company, Rochester, N.Y.
13. For a complete discussion of screen darkness levels the reader is referred to Denno, Raymond E., Classroom Screen Darkness for Educational Film Projection, Audio Visual Communication Review, 6:5-22, winter, 1958.

rare, and at best, subject to great variance. Hayes[14] discusses this problem at some length. His headphone specifications include an upper frequency limit of only 6,000 cycles. While this is some 2,500 cycles short of his overall system high frequency limit, he indicates that it is the highest frequency which can be accurately determined by present techniques.

Because of the peculiarities of headphone performance, listening tests are perhaps as effective in determining quality as scientific measurement.

Microphones are normally mounted in one of two ways for student use: (1) Fixed boom, and (2) headphone boom. The fixed boom type microphone is attached directly to the desk surface and equipped with a metal gooseneck or a rigid metal pipe with a two-way swivel. This type of installation is normally service-free and tamperproof. However, students find it difficult to maintain a constant distance from this type of microphone, causing recordings to vary considerably in volume and in quality. This problem can be overcome by selecting a headphone mounted boom microphone. Such a microphone, though somewhat more fragile, is located on the headphone and is thus in a fixed position in front of the mouth. This positioning maintains a constant distance between speaker and microphone and insures consistent recording quality.

2. Booths

One of the basic advantages of the electronic classroom lies in its potential for simulating an individual learning environment. To provide this simulation, virtually all early electronic classrooms were equipped with individual student booths which isolated one student from another,

14. Hayes, Alfred S., pp. 85-86

both physically and psychologically. These booths are still widely used and are available from virtually every EC manufacutrer.

Such booths have been justified from 3 standpoints: (1) Physical isolation is necessary to encourage independent work; (2) psychological isolation reduces anxiety level; (3) the acoustic treatment of the interior walls of the inclosed booth absorbs external sound and creates a student environment in which extraneous noise is reduced from the level found in the conventional classroom situation.

As complete booth installations have been used, however, certain important disadvantages have become apparent.

It is frequently quite convenient during an electronic classroom period to revert to a more conventional class arrangement, in which all students can see the teacher and each other. This, of course, is most awkward with a fixed booth arrangement. Further, as more visual materials become available for electronic classroom use, good sight lines to projection screens become important. Fixed booth designs rarely provide for unobstructed visual access to projection surfaces.

Two technological developments have rendered full booths far less important than they once were. First, the fully cushioned earphone makes possible a high degree of sound isolation for each student. Headphones of this type reject almost all outside noise and permit much higher levels of concentration than were possible before their introduction. A second innovation, referred to as the sound canceling microphone, accepts only sound generated in the immediate area of the instrument, and "cancels" virtually all extraneous sound. With this specialized piece of equipment, the student receives only the sound of his own voice, while the random sounds of the classroom and the responses of other students are

effectively curtailed.

A useful means of achieving the benefits of the student booth and the flat work surface is the so-called "convertible classroom." Furniture of this type is designed with a folding student partition which, when raised, provides a separation of moderate height between students. When closed, or folded down, the partition provides a flat working surface and, at the same time, covers all electronic equipment. This furniture can be specified with an electrical locking system which can be operated from the teacher's console.

3. Equipment for Independent Study

As outlined in Chapter II, the electronic classroom can serve students on an independent basis as well as in class situations. This mode of use can be applied in at least three ways: (1) It can provide a facility in which students who have missed class work can make it up; (2) it can provide a facility for students who need additional work; and (3) it can provide an environment in which the advanced student can pursue projects best suited to his ability. Students working independently must have access to program material at their own positions. This is normally provided by a dual channel tape recorder at each independent study position. This equipment provides for both recording and playback of program material and student responses. Students using independent study equipment of this type customarily have access to a library of prerecorded tapes from which they may draw appropriate material.

Within the past two years, considerable attention has been devoted to a far more sophisticated concept of individual study facility. Based upon the medieval monastic carrel, this innovation brings the capabilities

of technology into a type of learning space common in the 12th century. The electronic study carrel is designed to provide a student with telephone type dial access to both visual and audio information. It is anticipated that, within the near future, student study carrels of this type will be coordinated with library information retrieval systems which will permit rapid access to print information and significantly reduce the hours of library searching that now characterize independent student projects and masquerade under the name of "research."[15]

An additional dimension of this new concept, the student response system, is undergoing experimentation in two school districts in New York State at this writing.[16] Usable in either a group or independent study situation, the electronic student response system enables a teacher to question a single student or a group of students. By means of a small response console at each student position, responses can be collected automatically and analyzed for teacher reference or, in the case of independent responses, transmitted to the student himself for analysis of his own work.[17]

Equipment of this kind, though not yet generally available, is undergoing serious experimentation in a number of schools and has every indication of suggesting logical next steps in the ways that communication technology can serve education.

---

15. A discussion of this concept can be found in an article entitled "Space for Individual Learning," Overview, 4:29-34, Mar. 1963. Certain other new technological developments of the electronic classroom can be found in Hocking, Elton, Language Laboratory and Language Learning, Mono. No. 2 Department of Audiovisual Instruction, National Education Assoc., Washington, pp. 141-152.
16. Experimentation on automatic response systems in now being conducted under New York State Education Department sponsorship at the Westfield Academy, Westfield, N.Y., and the Herkimer County Board of Cooperative Educational Services, Herkimer, N.Y.
17. A further discussion of response equipment can be found in Brown, James W., "Student Response Systems," Audiovisual Instruction, 8:214-219, Apr. 1963.

Appendix A

The following specifications are recommended for electronic classrooms installed in schools in New York State. They are reprinted (with minor changes) from Language Laboratory Facilities: Technical Guide for the Selection, Purchase, Use and Maintenance, by Alfred S. Hayes, for the Electronic Industries Association, published by the Office of Education, U. S. Department of Health, Education and Welfare, Bulletin 1963, No. 37, OE-21024, pp. 106-119.

It should be understood that the following specifications are included as a model only. They are designed to procure an electronic classroom of 30 student stations, 24 of which are designated as listen-respond (audio-active) and 6 of which are listen-respond-record. The classroom is specified to provide for an intercommunication unit.

Some alternatives (such as booth or no booth) are written into the specifications and can be used if required. Nothing in the following specifications should be construed as limiting the purchaser from changing the overall system or any components to meet specific needs or to conform to user preferences. However, changing of the electronic performance specifications is not recommended, since this would have the effect of possibly reducing the carefully constructed level of quality built into them.

Sample Procurement Specifications For An Electronic Classroom

Conditions or features considered optional within this system are marked *.

1. GENERAL CONDITIONS

1.1 This specification describes a selection of interconnected items of electronic and electro-mechanical equipment to be used at (institution), hereinafter termed the institution.

1.2 The equipment herein described and specified is to be installed in (room, building, institution, address), and the area so designated, together with the equipment to be installed herein, shall hereinafter be termed the electronic classroom.

1.3 The institution will eventually negotiate only with a single selling agency, to whom funds will be paid, and who will be responsible for the successful completion of the electronic classroom installation. This selling agency, whether the manufacturer, his representative, agent, or duly approved firm of installers, shall hereinafter be termed the seller.

1.4 (and such further numbered items as are necessary, should state the requirements dictated by institutional procurement procedures, and by applicable State and local laws and ordinances, especially those relating to the securing of permits and licenses, the carrying of insurance, prevailing wage rates, the furnishing of bonds, compliance with construction and electrical codes, etc. The seller should be specifically required to certify that electrical shock hazard is negligible at all points at which the user comes in contact with the equipment, and that, under normal operating conditions, no danger exists of coming into accidental contact with portions of the equipment, such as motors, fans, etc., which would cause injury to students or teachers.)

1.5 (To be renumbered as required by the content of 1.4) Actual installation shall be made by an authorized agent of the manufacturer, who is thoroughly familiar with the equipment, and who shall have available to him, whenever required, the services of a factory engineer.

1.6 The seller shall supply and install all equipment, wire, and incidental hardware necessary for the successful completion of the installation, except: (detail items to be supplied by the institution, usually only electrical power service and outlets as shown on a specific electrical wiring diagram.)

1.7 The seller shall agree to install all equipment in a professional and workmanlike manner, in accordance with good construction and engineering practices.

1.8 The seller shall agree that all performance specifications herein set forth will be regarded as the minimum standard acceptable.

1.9 The seller shall agree to sponsor, as soon as the electronic classroom is ready for regular student use, a program of instruction by a qualified electronic classroom specialist to all teachers and other personnel involved in the operation and administration of the classroom. This program shall include the necessary minimum of group instruction, plus a single check-out of each individual in the operation of all equipment. See also 3.5.

1.10 The institution reserves the right to withhold final payment for equipment furnished and services rendered by the seller until thirty (30) calendar days shall have elapsed, during which operation shall have included full and satisfactory implementation of all specified functions of all equipment, and performance at least according to the minimum standards set forth in these specifications as certified by the institution's designated technician. The last day of this 30-day period shall be considered the official completion date.

1.11 The seller shall agree to furnish all emergency service, including parts replacement and installation labor, both until the official completion date as determined in 1.10 above, and for a period of one calendar year thereafter. Such service shall be furnished within 24 hours after an authorized service request. Before the official completion date, such service, parts replacement, and installation labor shall be furnished without cost to the institution, except in cases of obvious vandalism. For one calendar year thereafter, such service, parts replacement, and installation labor shall continue to be furnished without cost to the institution except: (a) in cases of obvious vandalism, and (b) in cases of trivial service requests due to failure of teaching personnel to understand the operation of equipment.

1.12 The seller shall furnish an estimate of maintenance costs of the proposed language laboratory, projected for each of two years following the first full year of operation, reckoned

from the date of completion as determined in 1.10 above, and a statement of the seller's estimated charges for continuing to supply emergency service. Nothing in this section shall be construed as an obligation upon the institution to continue to use the services of the seller beyond the period specified in 1.11 above.

1.13 The seller shall assist the institution in setting up a suitable preventive-maintenance program.

2. GENERAL DESCRIPTION

2.1 The electronic classroom shall contain a teacher's console with tape and disk program sources and switching facilities. Monitoring and teacher-student intercommunication facilities shall be provided. There shall be 30 student positions, of which 24 shall each be equipped with headphones and microphone for audio-active listening and responding, and of which 6 shall each be equipped, in addition, with a dual-channel tape recorder.

2.1.1 The term "audio-active" shall be defined to mean that the student, whether or not he has his own recording facilities, shall be able to listen to any designated program source, and, while responding or recording, hear his own voice amplified through his own headphone and microphone system.

2.1.2 The term "dual-channel tape recorder" shall be defined to mean a tape recorder or tape deck which provides separate program and student tracks, using two record heads and two playback heads. Erasure of the lesson (program) track shall not be possible at the student position.

3. GENERAL SYSTEM SPECIFICATIONS

3.1 Conservative operation. No tube, transistor, condenser, or resistor anywhere in the system shall be operated in excess of the maximum ratings specified by the original parts manufacturer for the class of operation involved.

3.2 Extraneous noise. Extraneous noise, including hum, crosstalk, AC hash, frying noises, feedback under normal operating conditions, microphonics, and switching transients, shall be inaudible at normal listening level. But the seller shall not be held responsible for the existence of extraneous noise due to causes beyond his control, such as, for example, interference from nearby radio or television transmitters, from unshielded or unsuppressed

electronic apparatus in the same or nearby buildings, or from fluorescent lighting. The seller shall, however, exercise all due care in seeking to predict and avoid such interference.

3.3 Heavy-duty Equipment

3.3.1 Tape recorders. The seller shall subscribe, in writing, to either, but not both, of the following statements: (a) the tape recorder units used are (brand name) units, originally designed for home service; (b) the basic mechanical design of the tape-recorder units used is not that of units originally designed for home service. The top plate, motor(s), clutch and braking system, and operating controls have been chosen and built to withstand the rigors of institutional use.

3.3.2 Headbands, cords, and plugs. The headbands on headphones, and cords and plugs furnished with headphones and microphones, shall likewise have been designed to withstand the rigors of institutional use. The seller shall furnish written evidence that these items have a good service record. If the items proposed are a new development, the seller shall furnish a description of the testing procedures used by the manufacturer to establish their durability.

3.3.3 Control knobs. Control knobs on volume controls and switches shall be either double set-screw types, or equivalent types designed for trouble-free operation. Round-shaft controls with single set-screw knobs shall be unacceptable.

3.3.4 Volume controls. Preference shall be given to volume controls which incorporate special features designed to increase ruggedness and reliability. Conventional types shall, however, be considered acceptable.

3.4 Tape breakage. It shall be impossible to cause breakage or spillage of tape through manual operation of tape recorder controls.

3.5 Balanced levels. The system shall be so designated that, at a satisfactory volume in any mode of operation (record, playback, listen, intercom, monitor), switching to another mode will not cause disturbing changes in volume. To assure proper operation of intercom facilities, the seller shall, as part of the instructional program specified in

1.9, instruct teachers in proper microphone technique, including the best talking distance for a given voice and volume setting.

3.6 Constant output with varying load. The system output circuitry shall be such that the output level does not vary more than 3db from no load to full load.

3.7 Impedance matching. Impedance and compatibility considerations shall be observed in accordance with the basic design of the complete system, and in accordance with approved engineering practices.

3.8 Provision for expansion. Initial wiring shall provide sufficient cable for all present and future distribution needs, including eventual installation of tape recorders at all student positions. In addition, at least one spare line shall be included in each distribution cable.

3.9 Easy accessibility. All individual components shall be readily accessible for service. Wherever feasible, plug-in components shall be used.

3.10 Line terminations. Distribution lines shall terminate, at both console and student positions, in barrier-strips or other suitable junction hardware, to permit efficient trouble shooting. Line terminations shall be identified by labelling of barrier-strips, or by a chart which identifies color-coded lines.

3.11 Component parts lists and schematics. To assure ready access to necessary replacement parts and essential service data, the seller shall supply: (a) a parts list for each component subassembly, which distinguishes between standard parts - those readily available from electronics parts dealers - and parts of proprietary design, available only from the manufacturer; (b) an accurate schematic diagram of each component subassembly to facilitate diagnosis of circuit and component malfunction, component replacement, and circuit and mechanical adjustment.

3.12 System wiring diagrams. The seller shall supply with his proposal a wiring diagram of a typical installation, to suggest proper installation techniques, and to indicate the method and materials for interconnection of the various major units. Upon completion, a detailed wiring diagram of the final installation shall be supplied, to indicate wire location, the location of junctions, connections made at junctions, the type of connectors, wire coding, and any other data considered essential for efficient service.

4. THE CONSOLE

4.1 Physical description. The teacher's console shall be of

metal or wood construction, except for the top, which shall be of wood, metal, or plastic laminate. The top shall provide a clear writing surface, and shall be at standard desk height. Console equipment shall be so arranged that the teacher has a clear view of the room when seated. Space shall be provided in or on the console for up to (number) program sources, which shall preferably be accessible to the teacher for loading and unloading from the normal seated position.

4.2 Equipment and accessories. The console shall be furnished with the following equipment installed:

2 two-speed, manual-threading, single-channel, half-track tape recorders, 7½ and 3 3/4 ips

1 three speed manual disk (record) player, 33 1/3, 45, and 78 rpm.

1 control panel

The following accessories shall be furnished:

1 recording microphone

2 headphones

4.3 Equipment functions and associated controls

4.3.1 A master switch shall control the AC supply to all console equipment.

4.3.2 The tape recorders shall be equipped with controls to implement the following functions: (a) AC on-off; (b) record-duplicate, recording from any other program source, from the console microphone, or from the intercom system; (c) playback; (d) rewind; (e) fast forward; (f) *pause, (g) stop. The pause lever or switch shall instantaneously stop the forward motion of the tape in the record-duplicate and playback modes, without turning off the electronics. A volume control shall regulate the record-duplicate volume. A resettable digital counter shall be provided on the tape mechanism to indicate tape position.

4.3.3 A volume control and VU meter shall be supplied for each program source (channel), or a single VU meter shall be provided on the main control panel, with a selector switch to permit the operator to select the channel to be observed, and the necessary volume controls to permit proper adjustment of each channel.

4.3.4 A positive-indication selector switch shall be used for the selection of program sources.

4.3.5 Monitoring and intercom switches shall be arranged in rows, geographically oriented to the physical layout of student positions in the classroom.

4.3.6 Switching modes shall be provided to permit monitoring and intercommunication with (a) any individual student; (b) any row of students; (c) any combination of individuals and rows; (d) the entire class at one time (all-call).

4.3.7 Monitoring of individual students must be silent and undetectable by the monitored student, who must not hear any clicks, pops, or change of volume.

4.3.8 Switches used to implement 4.3.6 shall be self-cleaning with silver or gold-plated contacts.

*4.3.9 Switching shall be provided to establish "party-line" connections between students selected by the teacher.

*4.3.10 Switching shall be provided to permit temporary transfer of a student or group of students to any preselected program, without disturbing students not thus selected.

4.3.11 An extra headphone jack shall be provided for a guest listener.

*4.3.12 A single switch, on the microphone or on the control panel, shall permit simultaneous starting and stopping of all student tape recorders.[1]

4.3.13 The physical arrangement of controls and switches shall provide the maximum simplicity and operating efficiency consistent with the number of specified functions and the meeting of performance requirements. These factors will receive due consideration in evaluating proposals.

---

1. If this option is specified, student tape recorders must be solenoid operated.

5. STUDENT POSITIONS

5.1 Physical description.[1]

Student positions shall consist of rows of booths 30" wide, 24" deep, with a plastic laminate work surface 29 to 30 inches high. There shall be sufficient space between rows so that a student seated in normal working position does not prevent easy passage behind him. Acoustic barriers shall be provided between booths, 18" above the work surface, consisting of rigid perforated material on both sides. The core of the acoustic barrier shall be of suitable solid material. A layer of acoustic fiber glass shall cover each side of the core. The legs of the booths shall be adjustable for leveling purposes, and each row shall be anchored to the floor in such a manner as to prevent shifting. The front of the booths shall be fitted with clear ¼" safety glass for the full height between the work surface and the barriers. There shall be no sharp edges, burrs, or protruding screws on any part of the booths with which a person could come into contact in normal usage.

5.1A (alternate) Student positions shall be installed without dividing partitions at rows of tables, each of which shall be fitted with a plastic laminate top. Each table shall be of normal desk height, with positions installed at 30" intervals. Each one shall be anchored to the floor to prevent shifting.

5.2 All wiring shall be in concealed ducts within the structure, and all ducts shall be closed.

5.3 Equipment

Student positions, to the extent specified in section 2, shall be provided with the following equipment and accessories installed:

1 two-speed, dual-channel, manual-threading tape recorder, 7½ and 3 3/4 ips.[2]

1 student amplifier

1 volume control

1 set of headphones, with heavy-duty headband, cord, and plug

1 microphone, with heavy-duty cord and plug[3]

---

1. Dimensions are typical.
2. A single-speed machine may be specified if desired. This requires a prior decision concerning the desired speed.
3. For microphone and headphones, specify type of mounting.

5.4 Equipment functions and associated controls

5.4.1 The student positions shall be audio-active. See section 2 for definition.

5.4.2 Tape recorders, in positions so equipped, shall provide switching modes to implement the following functions: (a) AC on-off; (b) record-duplicate recording from microphone or program source; (c) playback; (d) rewind; (e) fast forward; (*f) pause, (g) stop. The pause lever or switch shall instantaneously stop forward motion of the tape in the record-duplicate and playback positions, without turning off the electronics. A resettable digital counter shall be provided on the tape mechanism to indicate tape position.

*5.4.3 A meter shall indicate recording or duplicating level.

5.4.4 The volume control shall adjust the volume of the program source or student recording as heard in the student's headphones.

5.4.5 The physical arrangement of controls and switches shall provide the maximum simplicity and operating efficiency consistent with the number of specified functions and the meeting of performance requirements. These factors will receive due consideration in evaluating proposals.

6. SPARE COMPONENTS AND ACCESSORIES[1]

1 Console tape recorder

1 Student tape recorder

3 Student amplifiers

3 Headphones

3 Microphones

12 Headphone cords, with plugs attached

12 Microphone cords, with plugs attached

7. OTHER EQUIPMENT, ACCESSORIES, AND SUPPLIES

(Here may be listed professional recording and playback equipment, if desired for making master lesson and test tapes,

1. Spare components are classified by federal regulations under Title III, NDEA, as maintenance items, and, as such are not reimbursible.

as well as such items as a bulk eraser, a head demagnetizer, tape, tape splicing equipment, etc.)

8. COMPONENT PERFORMANCE SPECIFICATIONS

8.1 The amplifier

Input sensitivity:	1 millivolt RMS (-60db)
Frequency response:	150-12,000 cps $\pm$ 1 db 100-15,000 cps $\mp$ 2 db 60-20,000 cps $\mp$ 3 db
Total harmonic distortion:	preferred, 2% at maximum output; acceptable, 2% at operating level
Intermodulation distortion:	2%, 60 and 6,000 cps, 4 to 1 ratio
Signal-to-noise ratio:	60 db below 6 milliwatts, without reference to maximum output

Standard gainset and wave analyzer techniques shall be the basis for frequency response and harmonic distortion measurements respectively.

8.2 The tape recorder

Frequency response:	7½ ips	100-12,000 cps $\pm$ 2 db 250- 6,000 cps $\mp$ 2 db, no peaks or valleys greater than 1 db.
	3 3/4 ips	100- 8,000 cps $\pm$ 3 db 250- 6,000 cps $\mp$ 2 db, no peaks or valleys greater than 1 db.
Signal-to-noise ratio: (Peak record level to unweighted noise)	7½ ips	50 db
	3 3/4 ips	45 db
Flutter and wow:	7½ ips	Not to exceed .2% RMS
	3 3/4 ips	Not to exceed .3% RMS

A peak shall be defined as an area of extra amplification less than a quarter-octave wide. A valley shall be defined as an area of attenuation more than a quarter-octave wide. Peak record level is defined as that level at which the overall (input to output)

total RMS harmonic distortion is 3 percent when measured on a 400 cycle tone. Noise is measured when erasing a signal of peak record level, and in absence of a new signal. Thus, bias and erase noise are included, as well as playback amplifier noise. All components between 60 and 15,000 cps are measured.

8.3 The disk (record) player

Unit type:	Manual, with either integral or separate tone arm
Playing speeds:	33 1/3, 45, 78 rpm
Motor:	4-pole induction, or hysteresis-synchronous type
Turntable:	12" diameter; weight, 5 pounds or more
Turntable assembly mounting:	Spring mounting, or other suitable means of isolation from external vibration
Flutter and wow:	.2% RMS
Rumble:	50 db below average recording level
Cartridge type:	preferred, magnetic (requires proper preamplification); acceptable, ceramic
Stylus (needle):	1-mil (or less) diamond for 33 1/3 and 45 rpm disks; 3-mil sapphire for 78 rpm disks
Vertical stylus force (tracking pressure):	4 to 6 grams, or less[1]
Stylus compliance:	2×10^{-6} cm/dyne. Higher compliance preferable
Frequency response:	100-8,500 cps $\pm$ 2db[2]

Cartridges of the type usually furnished as replacement units in low-cost, one piece portable phonographs shall not be acceptable. The frequency-response characteristics of the cartridge and stylus combination shall be those of (brand name, model number) or equal.

---

1. But note that too light a tracking pressure, for a given cartridge, stylus, and tone arm, can cause the stylus to skip grooves or slide over the record.
2. Frequency response is a function of both cartridge and stylus. 100-8,500 cps $\pm$ 2db is adequate, but available cartridges actually suitable for this application usually claim 20-20,000 cps $\pm$ 2db.

8.4 The Headphone[1]

8.4.1 The seller shall supply to the institution, or to the latter's designated technician the following data pertaining to all proposed headphones:

a. The original manufacturer's brand name and model number.

b. A graph of expected performance, made with equipment and procedures conforming to the American Standards Association Publication Z24.9, 1949.

1. This graph shall be to a scale which permits reading in decibels ref. 1,000 cps to ½ db. Five db shall occupy no less than 3/8"

2. The horizontal scale shall readily accommodate readings from 20-20,000 cps, the vertical scale at least 60 db.

c. A statement of the maximum sound pressure level attainable at 1,000 cps at no more than .5 percent total harmonic distortion, and the voltage required across the stated impedance of the unit to produce that level.

8.4.2 The seller shall certify that the following conditions obtained in making the graphed measurements:

a. Sufficient weighting shall have been used to give the best low-frequency response of which the unit is capable.

b. No other coupler adjustments shall have been made to improve the indicated performance.

---

1. Headphones and Microphones - The frequency response of headphones and microphones and cartridges is often stated in the manufacturer's literature without indication of intensity deviation ($\pm$ x db) over the range. So stated, the claim of achieving a given frequency response is meaningless. The realistic frequency-response requirements formulated in these specifications are hence often associated with very inexpensive headphones and microphones which neither state nor can meet the intensity deviation limits. In practice, therefore, it will be important to specify, by brand name and model number, a headphone or microphone of known quality, or its equivalent. A qualified technical consultant should be able to give sound advice on this point.

c. The curve shall not have been artificially smoothed at any point.

d. No amplifier compensation shall have been used to give a spurious response indication.

The following performance figures shall be considered representative of headphones presently acceptable in this application.

	QUALITY SEALED-CRYSTAL	QUALITY DYNAMIC
	db referred to 1,000 cps	
100	-2	+1
250	-2	0
500	-1	0
1,000	0	0
1,500	+3	0
2,000	+1	-1
3,000	0	+3
3,500	-1	+4
4,000	0	+3
5,000	0	-1
6,000	+2	+8
	At 1,000 cps, the sealed-crystal unit shall produce an average sound pressure level of 100 db, ref. .0002 dynes/cm^2, in a closed 6cc rigid chamber, with 2 volts developed across 90,000 ohms. Total harmonic distortion at this sound pressure level shall be less than .5 percent.	At 1,000 cps, the dynamic unit shall produce an average sound pressure level of 108-112 db, ref. .0002 dynes/cm^2, in a closed 6cc rigid chamber, with 1 volt developed across 300 ohms. Total harmonic distortion at this sound pressure level shall be less than .5 percent.

8.5 The microphone[1]

The seller shall supply to the institution, or to the latter's designated technician, performance graphs of all proposed microphones, which shall conform to headphone graph specifications 8.4.1 a, b 1 and 2, and 8.4.2, c and d.

---

1. See footnote on page 47.

8.5.1 Teacher-recording (console) microphone

Type:	Dynamic
Frequency response:	40-15,000 cps listed, 100-10,000 cps ± 5 db, generally rising characteristic
Distributional characteristics:	cardioid or nondirectional

Impedance and output level shall be chosen to match the amplifier with which it is to be used. Performance shall be that of (brand name, model number), or equal.

8.5.2 Student Microphone

Type:	Dynamic, ceramic, crystal, or magnetic
Frequency response:	100-8,000 cps ± 5 db
Distributional characteristics:	Cardioid or nondirectional

Impedance and output level shall be chosen to match the amplifier with which it is to be used. Microphones of the type usually packaged with home-type recorders shall not be acceptable. Performance shall be that of (brand name, model number), or equal.

Appendix B

Reference Material

Items of particular interest are marked with an asterisk (*).

*Audiovisual Instruction, 7:602-648, Special issue on foreign language learning, language laboratories, and electronic classrooms, Nov. 1962

Barrick, Mac E., "Variety and Language Laboratory Success," Modern Language Journal, 45:361-365, Dec. 1961

Borglum, George P., Modern Language Audio-Visual Research Project, Wayne State Univ., Detroit, Mich., 1964

Brickell, Henry M., Organizing New York State For Educational Change, New York State Education Department, Albany, 1961

Brown, James, W., "Student Response Systems," Audiovisual Instruction, 8:214-219, Apr. 1963

Ciccfari, Vincenzo, "What We Can Expect From The Language Laboratory," Modern Language Journal, 45:3-9, July 1961

Delattre, Pierre, "Testing Audio Equipment by Ear," Audiovisual Instruction, 5:156, May 1960

Denno, Raymond E., "Classroom Screen Darkness for Educational Film Projection," AV Communication Review, 6:5-22, winter, 1958

Flaxman, Seymour L., ed., Coordination Between Classroom and Laboratory, Northeast Conference of the Teaching of Foreign Languages, New York Univ., 1961

Foundation for Effective Audiovisual Projection, Eastman Kodak Company, Rochester, 1962

Gaudin, Lois S., "The Language Laboratory and Advanced Work," Modern Language Journal, 46:79-81, Feb. 1962

*Hayes, Alfred S., Language Laboratory Facilities, Technical Guide for the Selection, Purchase, Use and Maintenance, U.S. Department of Health, Education and Welfare, Bulletin 1963, No. 37

*_____ Step-by-Step Procedures for Language Laboratory Planning; Some Suggestions for Schools and Colleges, MLA Foreign Language Program Research Center, 4 Washington Pl. New York

*Hocking, Elton, Language Laboratory and Language Learning, Mono. No. 2, Department of Audiovisual Instruction, National Education Assoc., Washington, D.C., 1964

_____ "The Decade Ahead," Modern Language Journal, 48:3-6, Jan. 1964

*Hutchinson, Joseph C., Modern Foreign Languages in High School: The Language Laboratory, U.S. Department of Health, Education and Welfare, Bulletin 1961, No. 23

_____ "The Language Laboratory," School Life, 46:4, Jan. - Feb., pp. 14-17, 39-41, 1964

Keating, Raymond F., A Study of the Effectiveness of Language Laboratories, Institute of Administrative Research, Teachers Coll., Columbia Univ. 1963

King, Paul E., Study on Modern Language Laboratories, (unpubl. mimeographed paper), pp. 9-10, 1955

Kirch, Max S., "The Role of the Language Laboratory," Modern Language Journal, 47:256-260, Oct. 1963

Kone, Elliott H., ed., Language Laboratories: Modern Techniques in Foreign Language Teaching, Connecticut Audiovisual Education Assoc., Bulletin No. 19, New Haven, Conn., 1960

Koppes, Wayne F., Green, Alan C., & Gassman, M.C., Design Criteria for Learning Spaces, Rennselaer Polytechnic Institute, Troy, for the Office of Facilities, State University of New York, Albany, 1963

Landers, Bertha, ed., Foreign Language Audio Visual Guide, Landers Associates, Los Angeles, Calif., 1961

"Language Labs: An Updated Report," School Management, 7:85-92, Apr. 1963

*"Let's Learn About Language Labs," New York State Education Department, Albany, 1962

Locke, William N., "To Record or Not," Modern Language Journal, 64:278-279, Oct. 1960

Lorge, Sarah W., Report of Study on Foreign Language Laboratories in Secondary Schools, Bureau of Audio-Visual Instruction, Board of Education of the City of New York, an experiment conducted with the cooperation and financial assistance of the New York State Education Department, Albany, Project E. P. 120, 1962

_____ The Relative Effectiveness of Four Types of Language Laboratory Experiences, Bureau of Audio-Visual Instruction, Board of Education of the City of New York, an experiment conducted with the cooperation and financial assistance of the New York State Education Department, Albany, Project A 61/62, 1963

Marty, Fernand, "Language Lab Techniques: How To Get The Most Out Of Tape Equipment," Educational Screen, 37:176-177, Apr. 1955

Mathieu, G., "A Brief Guide to Sound Labmanship," Modern Language Journal, 44:123-126, Mar. 1960

_____ "Language Laboratories," Review of Educational Research, 32:168-178, Apr. 1962

Mayo, Helen N., "Class, Laboratory and Credit Hours in Beginning Modern Languages," Modern Language Journal, 47:23-25, Jan. 1963

Moore, Patricia, "A Language Laboratory Experiment in The Junior High School," Modern Language Journal, 46:269-271, Oct. 1962

Morton, F. Rand, "The Language Laboratory as a Teaching Machine," Publications of the Language Laboratory, Univ. of Mich., Ann Arbor, 1958

Siciliano, Ernest A., "Forensics in the Language Laboratory," Modern Language Journal, 45:305-306, Nov. 1961

Siegel, Paul, "Some Student Reactions to the Language Laboratory," High Points, pp. 53-56, June 1963

" Space for Individual Learning," Overview, 4:29-40, Mar. 1963

Stack, Edward M., Porter, John J., Porter, Sally F., Anderson, Eugene W., & Grittner, Frank, "The Keating Report -- A Symposium," Modern Language Journal, 48:189-210, Apr. 1964

Stack, Edward M., The Language Laboratory and Modern Language Teaching, Oxford Univ. Press, New York, 1960

*Title III NDEA Planning Guide, New York State Education Department, Albany, 1964

Turner, Daymond, "Occupation: Language Laboratory Director," Modern Language Journal, 48:151-154, Mar. 1964

Univ. of Michigan, Publications of the Language Laboratory, a series of preprints and reprints. Ann Arbor, Mich., 1958

Van Eenanaam, Evelyn, compiler, "Annotated Bibliography of Modern Language Methodology for the Year," Modern Language Journal, annually, usually in the Jan. issue

Vaughan, Clark A., " The Case for the Electronic Classroom," Independent School Bulletin Series of 60-61, pp. 56-58, May 1961

White, Laurence B., "Analysis of Problems of Maintenance and Operation of Language Laboratories in California High Schools," California Schools, 32:437-55, Nov. 1961

Whitehouse, Robert S., "The Workshop Program: Demonstrating the Value of the Language Laboratory," Modern Language Journal, 29:590-595, Nov. 1945

Young, Clarence W., & Choquette, Charles A., An Experimental Study of the Relative Effectiveness of Four Systems of Language Laboratory Equipment in Teaching French Pronunciation, Colgate Univ. Hamilton, 1963.

Appendix C

Directory of Manufacturers of Electronic Classroom Equipment

Aero Service Corporation
Educational Services Division
210 East Courtland Street
Philadelphia 20, Pa.

American Desk Manufacturing Company
Temple, Tex.

American Seating Company
901 Broadway, N.W.
Grand Rapids, Mich. 49502

Ampex Corporation
Consumer & Educational Products Division
2201 Landmeier Rd.
Elk Grove Village, Ill.

Audio Teaching Center
137 Hamilton St.
New Haven, Conn.

Berlant Automonitor Corporation
8525 Steller Dr.
Culver City, Calif.

Chester Electronic Laboratories
Winthrop Rd.
Chester, Conn.

Cousino Electronics Corporation
1941 Franklin Ave.
Toledo 2, Ohio

Dage-Bell Corporation
(formerly Thompson Ramo Wooldridge, Inc.)
6325 Huntley Rd.
Columbus 24, Ohio

DuKane Corporation
St. Charles, Ill.

Edu-Tronics, Inc.
459 Broadway
Hicksville, N.Y.

Electronic Futures, Inc.
301 State St.
North Haven, Conn.

Electronic Teaching Laboratories
5034 Wisconsin Ave. N. W.
Washington 16, D. C.

Fleetwood Electronics Division
Post Office Box 58
Zeeland, Mich.49464

General Electric Company
Educational Products Section
212 West Division Street
Syracuse, N.Y.

General Dynamics Electronics
Industrial Products
1400 N. Goodman St.
Rochester, N.Y. 14601

Hamilton Manufacturing Company
Two Rivers, Wis.

Instructomatic, Inc.
8310 Fenkell Ave.
Detroit 38, Mich.

Robert C. Merchant
Electronic Systems
Post Office Box 594
West Lafayette, Ind. 47906

Radio Corporation of America
Audio-Visual Department
Building 15-5
Camden, N.J.

Rheem Califone Corporation
1020 North La Brea Ave.
Hollywood 38, Calif.

Science Electronics, Inc.
195 Massachusetts Ave.
Cambridge 39, Mass.

Sigma Electric Company, Inc.
11 East 16th St.
New York 3, N.Y.

Switchcraft, Inc.
5555 North Elston Ave.
Chicago, Ill. 60630

Universal Electronics Laboratories
Corp.
510 Hudson St.
Hackensack, N.J.

Viking of Minneapolis, Inc.
9600 Aldrich Avenue South
Minneapolis 20, Minn.

Webster Electric Company
Racine, Wis.

THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of the University (with years when terms expire)

Edgar W. Couper, A.B., LL.D., L.H.D., Chancellor, Binghamton, 1968

Thad L. Collum, C.E., Vice-Chancellor, Syracuse, 1967

Alexander J. Allan, Jr., LL.D., Litt.D., Troy, 1978

George L. Hubbell, Jr., A.B., LL.B., LL.D., Litt.D., Garden City, 1966

Charles W. Millard, Jr., A.B., LL.D., Buffalo, 1973

Everett J. Penny, B.C.S., D.C.S., White Plains, 1970

Carl H. Pforzheimer, Jr., A.B., M.B.A., D.C.S., Purchase, 1972

Edward M. M. Warburg, B.S., L.H.D., New York, 1975

J. Carlton Corwith, B.S., Water Mill, 1971

Joseph W. McGovern, A.B., LL.B., L.H.D., LL.D., New York, 1969

Allen D. Marshall, A.B., LL.D., Scotia, 1965

Joseph T. King, A.B., LL.B., Queens, 1977

Joseph C. Indelicato, M.D., Brooklyn, 1974

Mrs. Helen B. Power, A.B., Litt.D., Rochester, 1976

President of the University and Commissioner of Education
James E. Allen, Jr.

Deputy Commissioner of Education
Ewald B. Nyquist

Associate Commissioner for Cultural Education
Hugh M. Flick

Director, Division of Educational Communications
Lee E. Campion

Chief, Bureau of Classroom Communications
Loran C. Twyford, Jr.

V365-064-7000